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INTERNATIONAL LASER SYSTEMS INC ORLANDO FL  
MAGLAD EFFECTIVE SIMULATION, RANGE AND ALIGNMENT TOLERANCE DEMO--ETC(U)  
NOV 76

N61339-76-C-0116

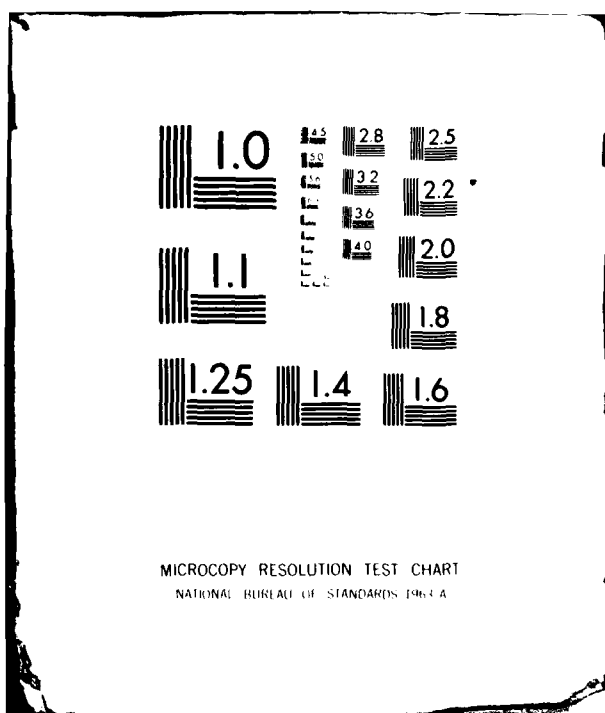
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**LEVEL**

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FILE TITLE	<u>MAGLAD</u>
FILE SECTION	<u>30</u>
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6 **MAGLAD**

**EFFECTIVE SIMULATION, RANGE AND ALIGNMENT  
TOLERANCE DEMONSTRATION TEST PLAN.**

ATTACHMENT TO THE

TRAINER ENGINEERING REPORT, PRELIMINARY

DATA ITEM A001AA

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**DEMONSTRATION - EFFECTIVE SIMULATION,  
RANGE AND ALIGNMENT TOLERANCE**

**1.0 INTRODUCTION**

The purpose of the demonstration is to demonstrate:

- The system's level of discrimination between hit and miss achieved with the MAGLAD system as compared to the actual E- and F-type stationary target profiles;
- The effectiveness and accuracy of the Rifle Sight/Laser Alignment Kit;
- System invulnerability to false alarms in highest ambient light conditions;
- The full-scale system's simulation effectiveness with simulated reduced visibility via beam-power attenuation;
- The moving-targets' lead angle simulation effectiveness; and
- The 1/12 scale target's simulation effectiveness.

The Effective Simulation, Range and Alignment Demonstration, CLIN 0002, will be conducted at the contractor's facility approximately seven months after date of contract award. This demonstration will utilize breadboard models of the:

- Laser Rifle Marksmanship Trainer Device A3F77 (CLIN 0003);
- Laser Radiation Detectors (CLIN 0003AA);
- Rifle Sight/Laser Alignment Kit (CLIN 0003AB);
- Laser Hit Indicator with Test Target Kit (CLIN 0003AC);
- Scaled Record Range targets and Radiation Detector (CLIN 0003AD) and
- Moving-Target Rifle Laser Radiation Detector Kit (CLIN 0003AE).

All test firing, during the effective simulation demonstration, will be conducted with laser pulses only. Blank firing of the M16A1 will not be required for this demonstration.

This document fulfills the data requirement of CDRL Item A001AA for a separate attachment to the Engineering Report containing Test Procedures and Results Report per DI-T-0001 delineating all test procedures and expected results associated with the demonstration specified in Section F for Item 0002.

**1.1 TEST DATE**

The dates for performance of the tests described herein will be established approximately 15 days prior to performance of the tests. The test date is tentatively scheduled for 1 February 77.

## 1.2 DESCRIPTION OF DEMONSTRATION

### 1.2.1 Full Scale Simulation Effectiveness Demonstration

Essential elements of the demonstration are shown in Figure 1.1. The test target consists of a target board with a visible aiming grid on which detectors can be arranged in configurations the same as they would be on E- and F-type targets in the simulation system at various ranges. The hit indicator consists of the signal processing system and power supply to indicate hits via a strobe light.

In the demonstration, expert riflemen--firing from supported positions after using the Rifle Sight/Laser Alignment Kit to align the rifle's sights--will fire at designated coordinates on the test target. Hits will be indicated by the strobe light and recorded by the observer. From the recorded data, contours of hit/miss will be developed and compared with E- and F-type targets.

This procedure will be repeated at:

- . Varied ranges from minimum to maximum with the appropriate target's detector configuration; and
- . With attenuation of the laser beam power using neutral-density (ND) filters to simulate reduced visibility.

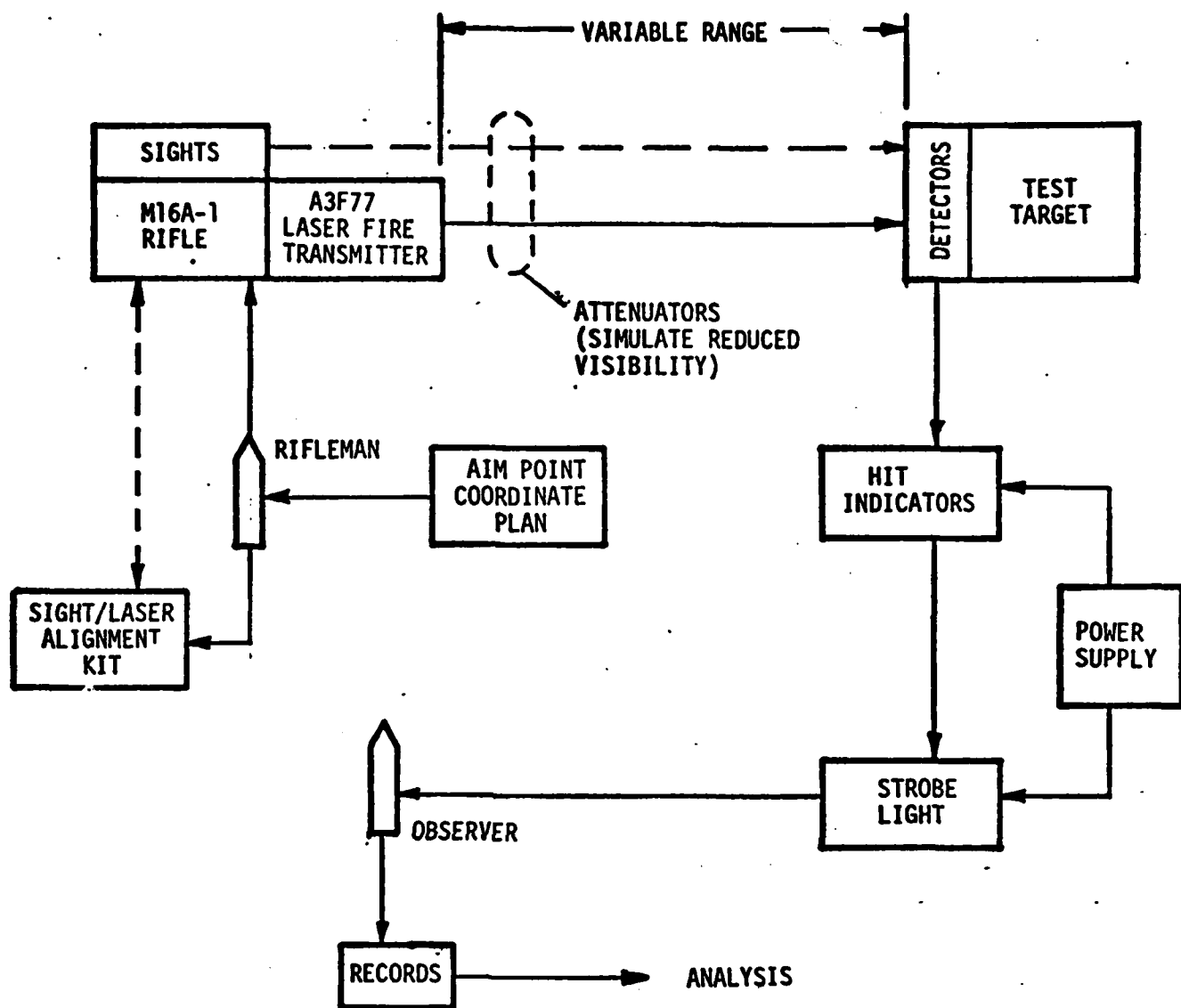
The resulting data will be used to assess the simulation effectiveness, considering the round-to-round dispersion of the M16A1.

### 1.2.2 Moving-Target Simulation Effectiveness Demonstration

The Moving-Target Rifle Laser Radiation Detector Kit will utilize identical detectors to those in the Target Laser Radiation Detector Kit.

In principle, this effectiveness demonstration is very similar to the full-scale simulation effectiveness demonstration using E- and F-type targets, except that in the final system, the target--a different, three-dimensional type--will be moved rapidly. Because of this motion, the detector array must be advanced in front of the target's position as a linear function of speed and range, in order to require the rifleman to take the proper target lead. The RETS moving-target mechanism configuration has not been defined at this date; therefore, the moving-target demonstration will prove static lead only.

Effective simulation utilizing the detectors in conjunction with the laser transmitter will have been demonstrated during the full-scale simulation effectiveness demonstration. Therefore, the Moving-Target Demonstration need only show mechanical compliance with the lead requirement specifications.



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Figure 1.1. Block Diagram of Full Scale Simulation Demonstration

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The Moving-Target Detector Kit will be installed on a stationary pedestal so that target pop-up and fall capabilities can be demonstrated. (See Figure 1.2). The operator will input the range and velocity program to the target lead servo control unit and activate the target's simulated motion. The resulting linear displacement from the visible target, of the detector array frame will be recorded by the observer. This procedure will be repeated at the appropriate simulated ranges and simulated target speed. The resulting data will be used to assess the simulation effectiveness of the Moving-Target lead mechanism.

#### 1.2.3 Demonstration of Range Performance in Varying Ambient Light Conditions

The invulnerability to false alarms of the system under the worst (brightest-light) conditions is the only important factor here. With fixed detection thresholds, reduced ambient light will have no effect on the system. The system's invulnerability to solar-light-induced (noise) false alarms will effectively be demonstrated by operation of the system targets in full sunlight. During the full scale simulation effectiveness demonstration, false alarms will be recorded and evaluated along with other pertinent data.

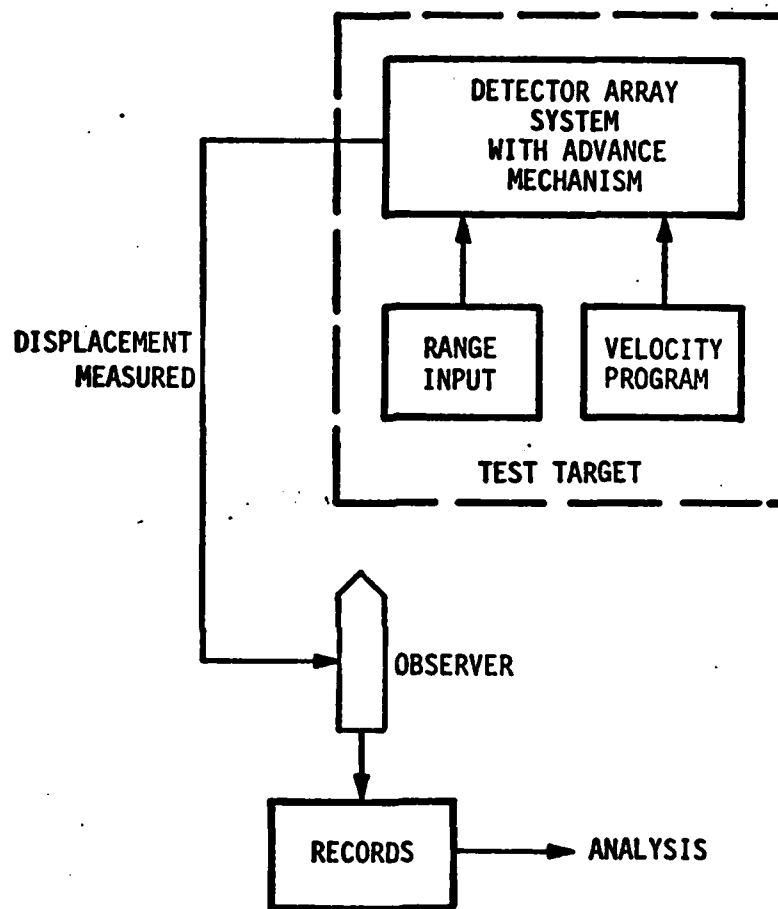
#### 1.2.4 Demonstration of Accuracy of Alignment

The problem involves mounting a statistically significant sample of transmitters on a statistically significant sample of M16A1 rifles and making a check for repeatability of alignment of transmitters with the open iron sights of the M16A1 rifles. However, only one transmitter will be available during this test phase.

The following procedure will be used:

- . Mount the laser transmitter on rifle;
- . Align the rifle sights with the transmitter using the Rifle Sight/Laser Alignment Kit; and
- . Mount the rifle and sight on a tripod and, using the rifle sights, align the laser transmitter on a remote detector. Fire the laser to determine the alignment of the center of its beam (moving detector across beam vertically and horizontally) with respect to rifle sight line.

This procedure will demonstrate that the Transmitter/Alignment Kit accuracy is adequate for the purpose intended. Data from the beam-power plots will give an indication of any persistent error in the alignment kit function.



P3198

**Fig. 1.2-Block diagram of Moving-Target Simulation Demonstration**

It should be noted that the iron rifle sights are used for all sighting functions. Thus, the alignment of the sights using the kit and the alignment of the aligned sights (and so the transmitter) with the reference point on the remote target/detector device should be done by a statistically significant number of expert marksmen. In this way, the human element enters in an ideal fashion.

#### 1.2.5 Scaled Range Simulation Effectiveness Demonstration

Essential elements of the demonstration are shown in Figure 1.3. A test target grid will be hinged on the 1/12 scale target assembly. The test target, with the appropriate silhouette, will be lowered to fire. The hit indicator is located on the target mechanism control panel.

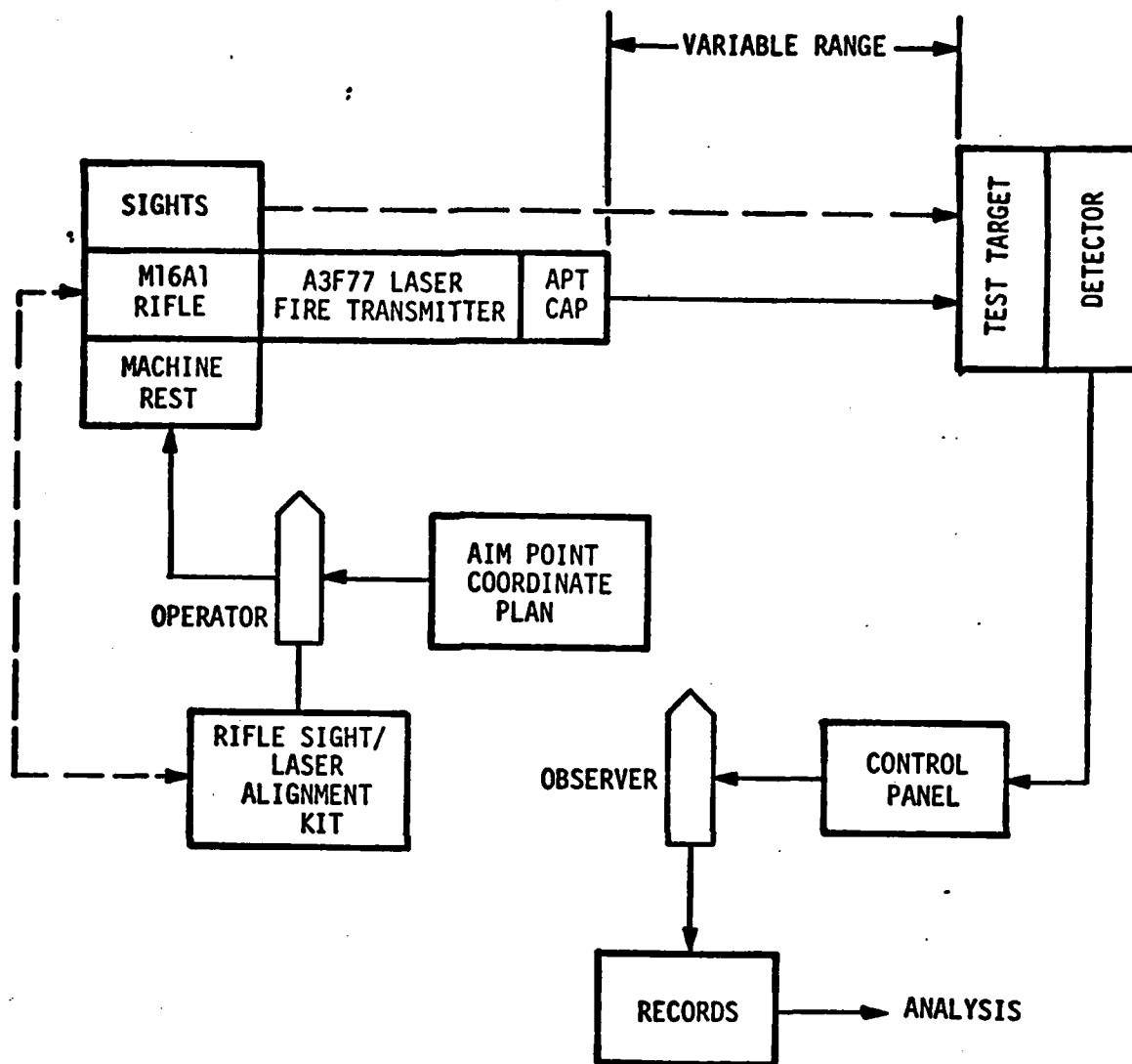
In the demonstration, an operator--firing from a machine rest after using the Rifle Sight/Laser Alignment Kit to align the rifles' sights--will fire at designated coordinates on the test target as in the full scale demonstration. Hits will be indicated on the control panel and recorded by the observer. From the recorded data, contours of hit/miss will be developed and compared with 1/12 scale E- and F-type targets. This procedure will be repeated at various ranges from minimum to maximum with the appropriate target configuration.

#### 1.3 FACILITIES AND EQUIPMENT

Demonstration of all simulations will be carried out at facilities to be provided by the contractor. The government will furnish all the expert riflemen required. The government also will furnish a statistically significant, randomly selected sample of M16A1 rifles for alignment checks. The contractor will instruct the riflemen in the use of the Rifle Sight/Laser Alignment Kit and maintain, adjust and operate all contractor furnished equipment.

The contractor will furnish for the tests:

- . One breadboard model of the A3F77 laser fire simulator rifle-mounted equipment (CLIN 0003);
- . One breadboard test target;
- . All breadboard detectors, mounts and harnesses (CLIN 003AA);
- . One breadboard hit indicator subsystem and power supply breadboard (CLIN 0003AC);
- . One breadboard strobe light subsystem;
- . Attenuators\*;
- . Cabling;



P3199

Fig. 1.3 Block Diagram of Scale Target Simulation Demonstration

- . One tripod\*;
- . One breadboard Rifle Sight/Laser Alignment Kit (CLIN 0003AB) ;
- . All batteries required;
- . Personnel adequate to set up and operate the equipment;
- . One breadboard moving-target laser radiation detector (CLIN 0003AE) ;
- . One moving-target test target pedestal (stationary);
- . One Velocity Program Function Generator\*;
- . Moving target lead position scale;
- . Six scale targets; (CLIN 0003AD) ;
- . One breadboard scale target laser radiation detector (CLIN 0003AD);
- . One Scale Range Test Target (CLIN 0003AD);
- . One transmitter aperture cap (CLIN 0003AD); and
- . One breadboard scale target control unit. (CLIN 0003AD).

\* Contractor property

## 2.0 TEST DESCRIPTIONS

### 2.1.0 Demonstration of Accuracy of Alignment

#### 2.1.1 Objective

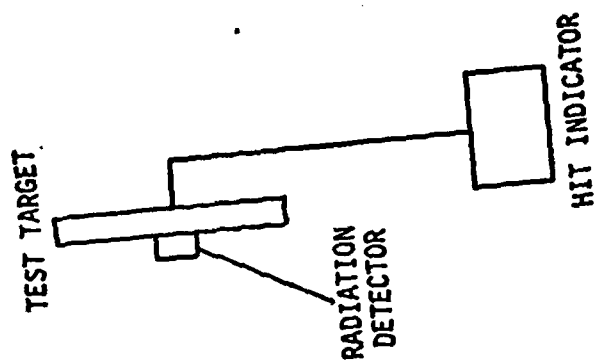
This procedure is to assure that the tolerances between rifle barrel reference surfaces and sight line are not excessive for the system and the transmitter/alignment kit function is adequate for the purpose intended.

#### 2.1.2 Equipment Required

- a. Breadboard laser transmitter (CLIN 0003)
- b. Rifle Machine rest
- c. Breadboard rifle sight/alignment kit (CLIN 0003AB)
- d. Breadboard Laser radiation detector (CLIN 0003AA)
- e. Hit indicator (CLIN 0003AC)
- f. Test target
- g. Battery supply, hit indicator
- h. M16A1 rifle

#### 2.1.3 Test Setup

This test will be performed using the configuration shown in Figure 2.1.



P3247

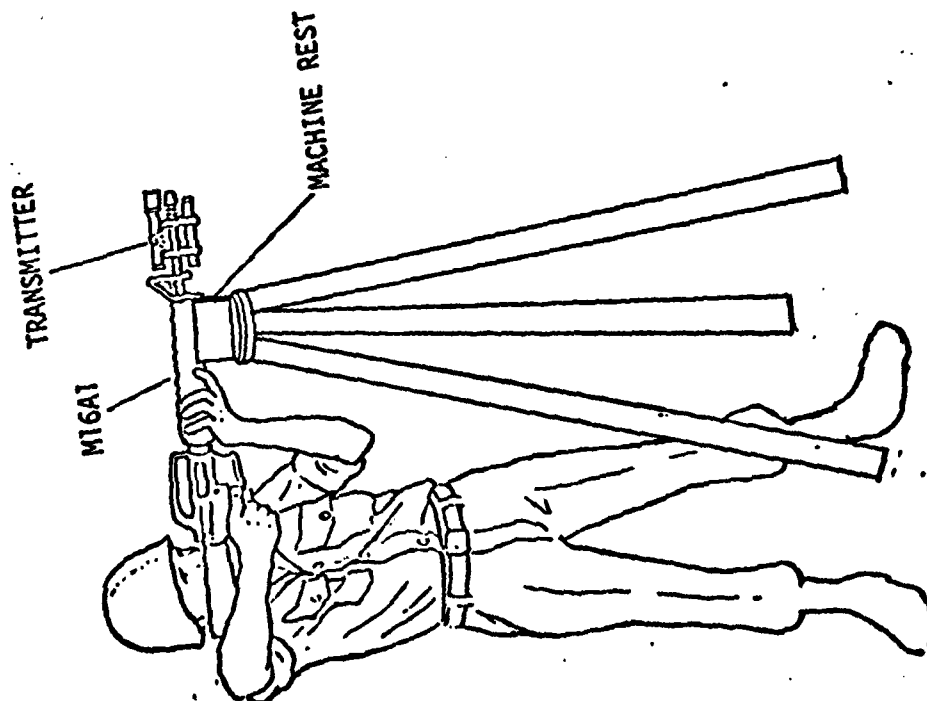


Fig. 2.1-Block Diagram of Alignment Accuracy Demonstration

#### 2.1.4 Test Duration

The estimated time required for this test element is one-half day.

#### 2.1.5 Data Required

The following data will be required throughout all firings conducted during this test element:

- a. Range to target
- b. Location of aim point
- c. Location of laser radiation detector
- d. Number of shots fired
- e. Number of target hits

#### 2.1.6 Test Procedure

The test target will be set-up with a single radiation detector at the center. A "hit" registered by the test target will be indicated by one flash of the hit indicator strobe light located near the test target.

Mount the laser transmitter on the M16A1 rifle and align the sights with the transmitter using the rifle sight/laser alignment breadboard kit.

Mount the rifle on a machine rest and using the rifle sights, align the laser transmitter on the test target detector. Fire the laser and record hit/miss. Move the detector on the test target to an adjacent grid and fire the laser and determine hit/miss. Repeat this procedure until the laser beam centroid has been established.

Replicate the above procedure on all of the M16A1 rifles made available by the government for the effective simulation demonstration.

Data will be combined to provide best estimates of alignment tolerance.

#### 2.1.7 Acceptance Criteria

The breadboard laser transmitter must demonstrate interchangeability among like weapons as specified (3.6.4 of N2234-129A). The breadboard rifle sight/laser alignment kit must provide for the alignment specified in 3.2.5.1 of N2234-129A (3.7.4 of N2234-129A).

#### 2.1.8 Test Recording

Data for this test will be recorded on the test record form shown in Figure 2.2. Aim points will be plotted on the chart shown in Fig. 2.3.

TYPE TEST \_\_\_\_\_

TARGET RANGE \_\_\_\_\_ DATE \_\_\_\_\_

TARGET TYPE \_\_\_\_\_ TIME \_\_\_\_\_

TRANSMITTER S/N \_\_\_\_\_ TEMPERATURE \_\_\_\_\_

DETECTOR S/N \_\_\_\_\_ HUMIDITY \_\_\_\_\_

ATMOSPHERIC CONDITIONS \_\_\_\_\_

ESTIMATED VISIBILITY \_\_\_\_\_

SIMULATED VISIBILITY RANGE \_\_\_\_\_

ATTENUATOR (ND) FILTERS \_\_\_\_\_

LOCATION OF AIM POINT (PLOT ON REVERSE SIDE).

SHOT #	HIT	PROPER RESPONSE	IMPROPER RESPONSE	NATURE OF FAILURE	# FALSE HITS
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

FIG. 2.3 TEST FORM - PAGE 1

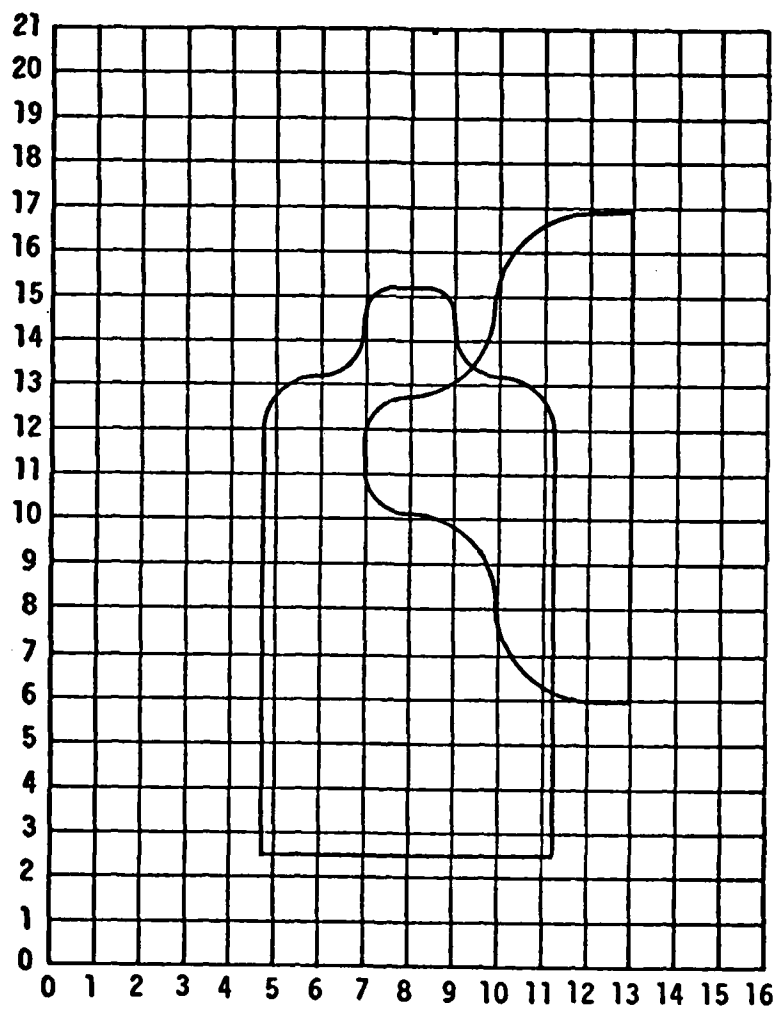
SHOT #	HIT	PROPER RESPONSE	IMPROPER RESPONSE	NATURE OF FAILURE	# FALSE HITS
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
TOTALS					

TEST CONDUCTED BY: \_\_\_\_\_

TEST WITNESSED BY: \_\_\_\_\_

APPROVAL BY: \_\_\_\_\_

DATE: \_\_\_\_\_



P3201

Fig. 2.3 - Test Record Chart

### 2.1.9 Tolerance Data

The rifle sight/alignment kit provides capability for aligning the sight pattern to 0.1mr, limited only by the user's ability to adjust his sights. This performance is well within the 0.28mr/click sight adjustment capability of the rifle.

## 2.2 EFFECTIVE SIMULATION OF FIRING WITH SERVICE AMMUNITION AT MINIMUM, MAXIMUM AND INTERMEDIATE RANGES.

### 2.2.1 Objective

A. These tests will utilize special testing targets with a matrix of aiming points provided both inside and outside of a superimposed target shape (with laser radiation detector mounted). Matrix aiming points will be where vertical and horizontal lines cross and will be close enough together to establish "hit" and "miss" areas within the required tolerance when the aiming points are "fired" upon successively by expert marksmen and gunners utilizing trainer equipped weapons. "Hit" or "miss" will be sensed by observing a flash hit indicator at the target. The results of each "shot" will be recorded on prepared tables or charts, and the "hit" and "miss" areas plotted on scale targets for submission with the test report. This test will be conducted for each type target specified at the minimum and maximum specified ranges and at the following intermediate ranges: Every 25 meters from 25 to 100 meters for the F targets and every 50 meters from 150 to 300 meters for the E targets.

B. Detection at maximum range, and limits of detection under condition of reduced visibility as follows:

1. Visibility reduced to 150 meters for targets located at ranges from 25 to 150 meters
2. Whenever the target is visible to the rifleman for targets located at ranges beyond 150 meters.

The test described in "Objective A" will be duplicated using attenuators (ND) filters in the transmitter to simulate the reduction in laser power at the target due to reduced visibility.

### 2.2.2 Test Equipment Required

- a. Laser transmitter (Breadboard CLIN 0003)
- b. Test targets
- c. Laser Radiation, Detectors (Breadboard CLIN 0003AA)
- d. Hit Indicator (Breadboard CLIN 0003AC)
- e. Battery supply, Hit Indicator
- f. M16A1 Rifle
- g. Expert Marksmen
- h. Bench rest, M16A1
- i. Tables/Charts
- j. Alignment Kit (Breadboard CLIN 0003AB)
- k. ND filters and holder

### 2.2.3 Test Set-Up

This test will be performed using the configuration shown in Figure 2.4.

### 2.2.4 Test Duration

The estimated time required for this test is 5 days.

### 2.2.5 Data Required

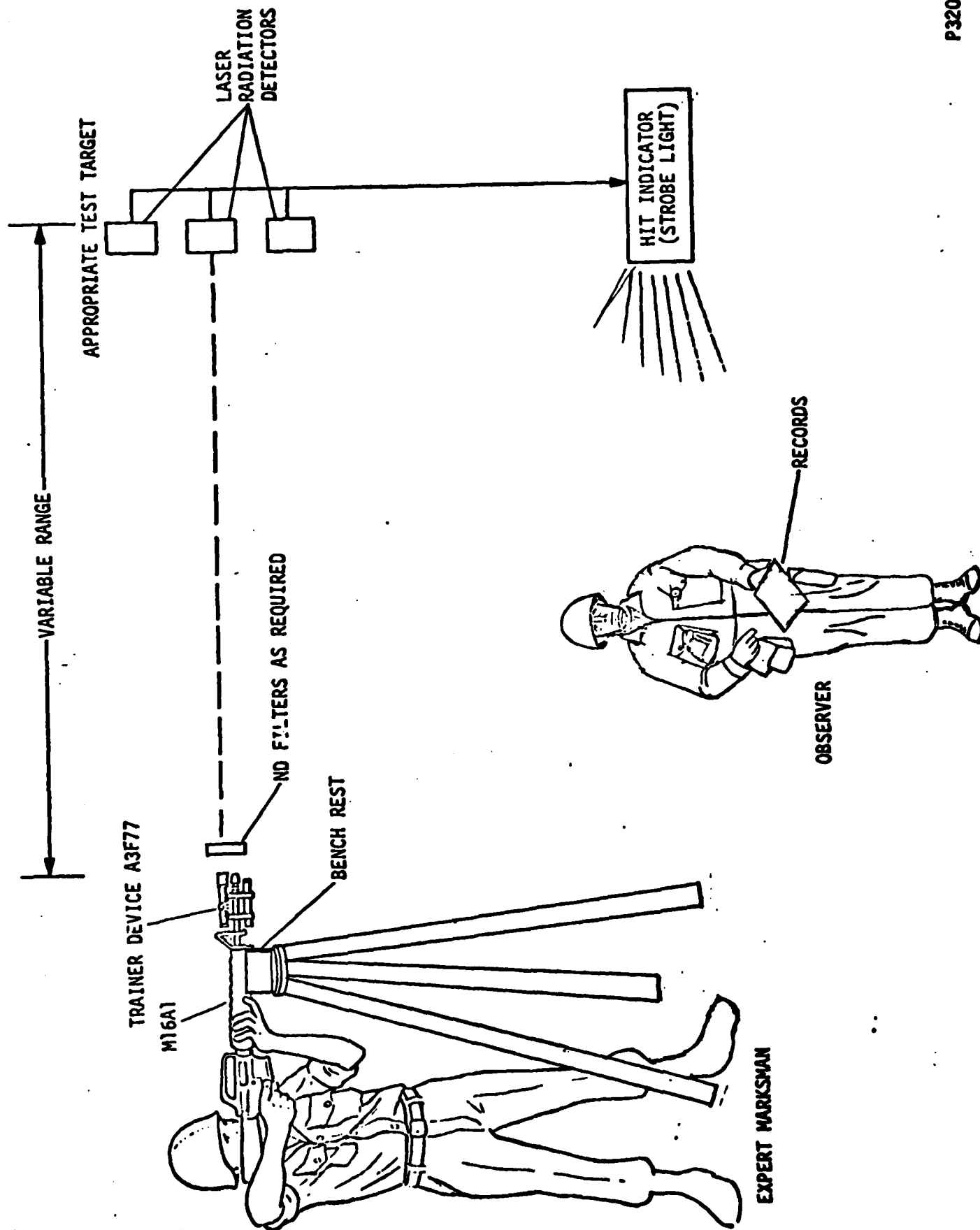
The following data will be required throughout all firings conducted during this test element:

- a. Range to target
- b. Target Configuration
- c. Location of aim point
- d. Number of shots fired
- e. Number of recorded target hits
- f. Number of false hits recorded
- g. Number of proper system responses
- h. Number of failures of system to respond properly
- i. Value of ND filter utilized to simulate a given visibility reduction.
- j. Visibility simulated.

### 2.2.6 Test Procedure

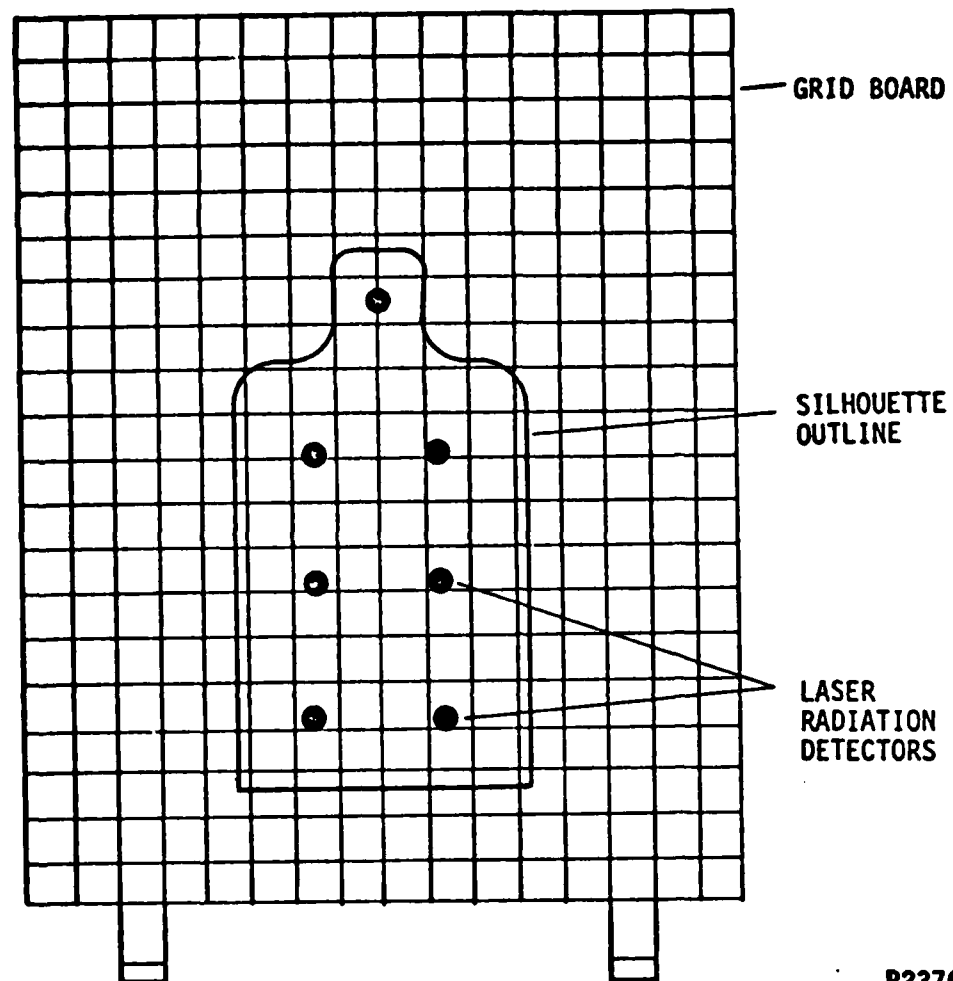
A. Simulation of Firing With Service Ammunition at Minimum, Maximum and Intermediate Ranges - The test targets for full scale "E" and "F"-type targets will be supported by a wooden stand. The targets will be painted white with a gridwork of black lines vertically and horizontally oriented and a black line outline of the appropriate target shape to be tested. The appropriate laser radiation detectors to be used with the target shape on the test target will be mounted in their proper position within the perimeter of the silhouette target (Figure 2.5). The grid spacing on each of eight test target ranges to be tested will have grid lines of appropriate spacing and width to provide aiming points which will allow establishment of effective simulation within a tolerance appropriate to the range and to the parameters of the weapons simulator.

A "hit" registered by the test target will be indicated by one flash of the hit indicator strobe light located near the test target. The strobe light will be visible at the firing line at up to a 300-M range with the use of optical devices in bright sunlight. For ranges between 25 and 100 meters, the laser detector arrays used will be compatible with an F-type silhouette target; for ranges between 150 and 300 meters, the detector arrays will be compatible with an E-type silhouette target.



P3200

Fig. 2.4 - Test Configuration, Simulation of Firing with Service Ammunition



P2376

Figure 2.5. Full Scale Test Target  
for E- and F- Type Silhouettes

A set of aiming points will be selected on the test target. These points will lie outside the silhouette target such that laser pulses aimed at these points should not trigger the Hit Indicator. In addition to these aiming points, a second set of aiming points which are within the target silhouette such that laser pulses aimed at these points should trigger the Hit Indicator.

Firing will be conducted from a bench-rest fixture by expert marksmen. A portion of the firing may be conducted by test operators firing from a machine fixture, at the discretion of the government.

At each of the ranges indicated in Table I, below, firings will be conducted using each of the aiming points of the group as indicated.

TABLE I - TARGET TYPE

<u>Target Range, Meter</u>	<u>Target Type</u>
300	E
250	E
200	E
150	E
100	F
75	F
50	F
25	F

Upon completion of the testing, the ratio of proper responses to improper responses will be calculated for each range of fire at each aim point considered. The relationship between percent correct response, range and percent incorrect response, range will be determined. Data will be combined to provide best estimates of effective simulation.

B. Detection Range Vs. Visibility - The test procedure will be essentially as described in "A" for "Effective Simulation of Firing With Service Ammunition". Additionally, an appropriate value of a-tenuation (ND filters) will be placed in front of the Laser Transmitter to simulate a reduction in visibility. Data collected will be combined to provide best estimates of effective simulation.

#### 2.2.7 Acceptance Criteria

Acceptance criteria which evaluates the test data in accordance with an interpretation of the visibility requirements (3.6.1.3 of N2234-129A) in terms of meteorological visibility will be provided prior to final submission of this test plan.

#### 2.2.8 Test Recording

Test data will be recorded on the test form shown in Figure 2.2. Aim points will be charted on the chart form illustrated in Figure 2.3.

#### 2.2.9 Tolerance Data

The objective is to demonstrate scoring accuracy consistent with the round-to-round dispersion of 0.4 mils,  $1\sigma$ , obtained with service ammunition using targets and ranges specified (3.2.1 of N2234-129A). The target hit probability for this dispersion is shown in Figure 2.6 as a function of aim point. Figure 2-6 assumes the E-type target.

### 2.3 OPERATION UNDER AMBIENT LIGHT CONDITIONS

#### 2.3.1 Objective

Demonstration of range performance in varying ambient light conditions.

#### 2.3.2 Test Equipment Required

Test equipment is not required.

#### 2.3.3 Test Set-Up

This test will be performed using the test configuration shown in Fig. 2.4.

#### 2.3.4 Test Duration

No additional time is required.

#### 2.3.5 Data Required

Data obtained in 2.2 Effective Simulation of Firing with Service Ammunition will provide requirements of this test element.

#### 2.3.6 Test Procedure

The system's invulnerability to ambient light induced false alarms, will effectively be demonstrated by operation of the system in full sunlight.

#### 2.3.7 Acceptance Criteria

The breadboard models of the laser transmitter, laser radiation detector and hit indicator should demonstrate a false alarm rate (false hits recorded) no greater than specified in Section 2.3.9.

#### 2.3.8 Test Recording

Data for this test element will be recorded during tests 2.1 and 2.2 of this test plan.

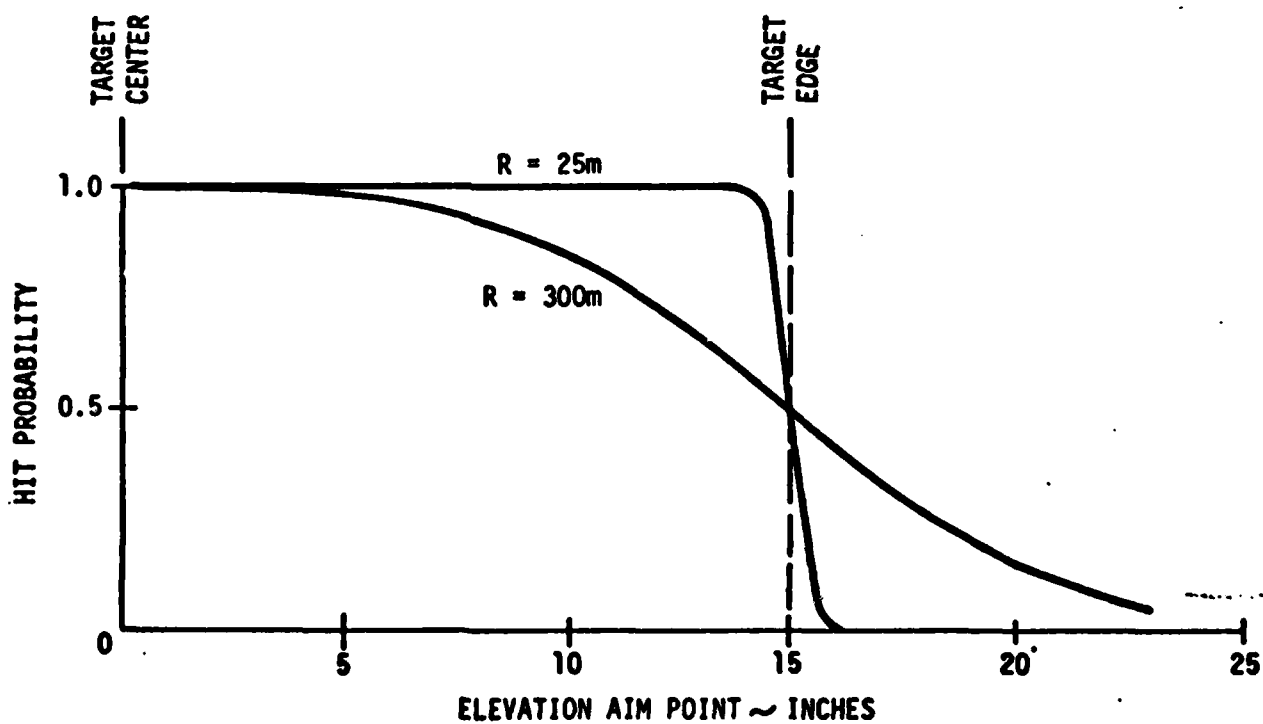
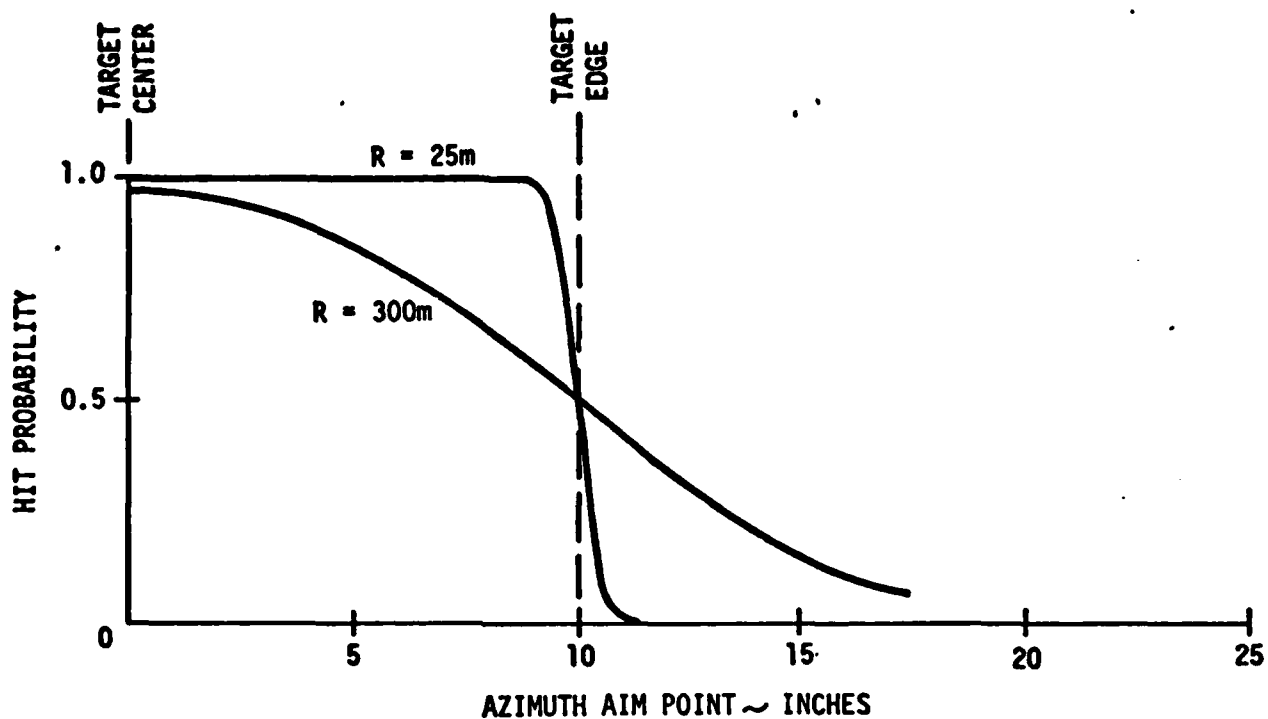


Figure 2.6. E-Target Hit Probability for the 0.4 mr,  $1\sigma$ , Weapon Dispersion

P2422

#### 2.3.9 Tolerance Data

The number of false hits recorded (false alarm rate), during the full scale simulation effectiveness demonstration, must be one percent or less of the total number of shots fired.

#### 2.4 . MOVING TARGET LEAD ANGLE SIMULATION DEMONSTRATION, STATIC

##### 2.4.1 Objective

To statically demonstrate that proper lead angle is achieved by applying a voltage representing the RETS tachometer output to the lead angle servo system, and observing the displacement of the detector array. Tests shall be conducted at the minimum and maximum simulated ranges of 25 to 200m and specified intermediate ranges (3.2.1 & 4.4.2.2.2 of N2234-129A). A simulated moving RETS target is not required as part of the Effective Simulation Test (Sec. F, C-6 of contract).

##### 2.4.2 Test Equipment Required

- a. Moving-target lead servo mechanism with detector mounting frame (Breadboard CLIN 0003AE)
- b. Target support pedestal
- c. Velocity program function generator
- d. 1 Meter measuring scale
- e. Test record form.

##### 2.4.3 Test Set-Up

This test will be performed using the configuration shown in Figure 2.7.

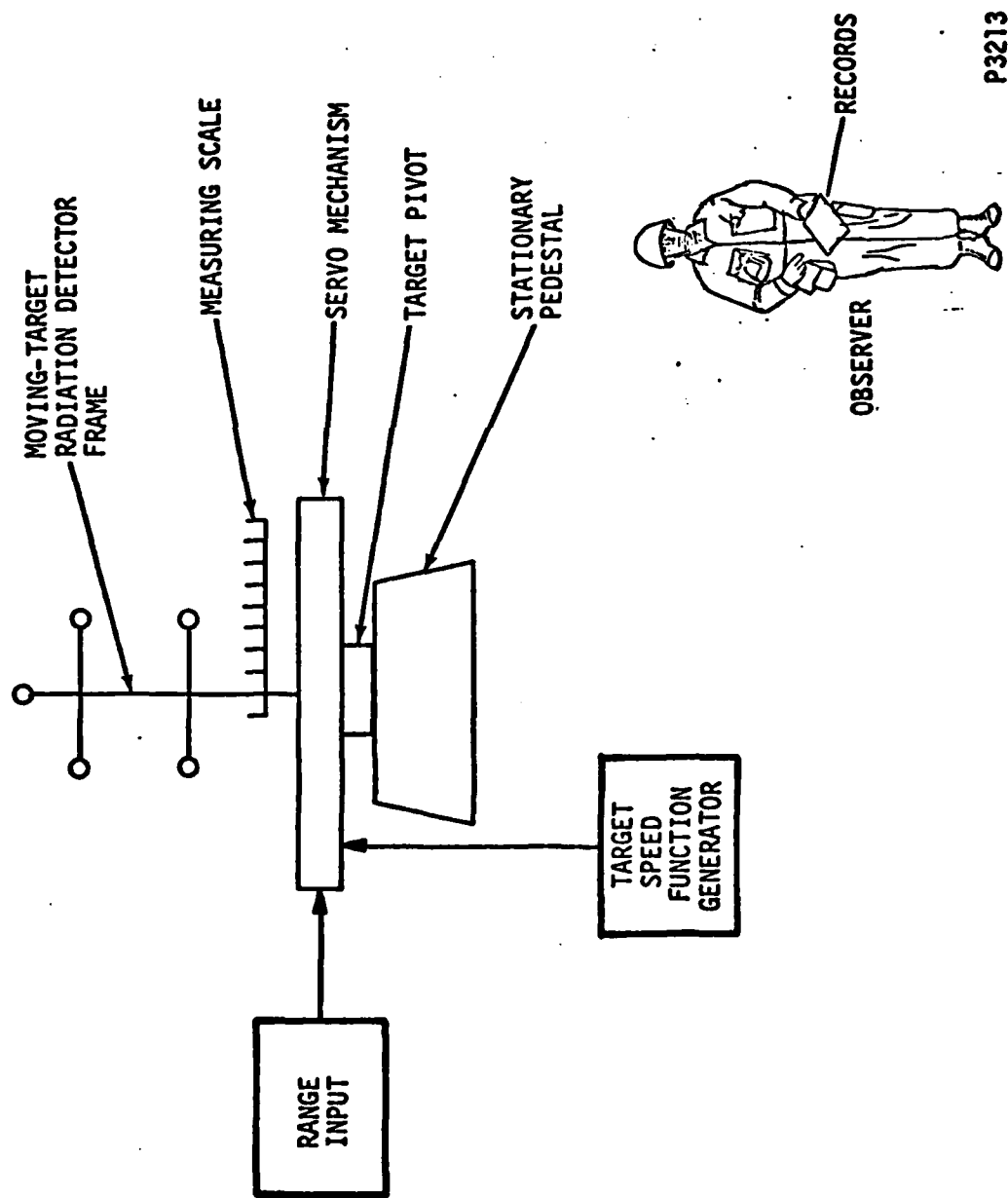
##### 2.4.4 Test Duration

The estimated time required for this test is one day.

##### 2.4.5 Data Required

The following data will be required throughout this test element:

- a. Range simulated
- b. Target speed simulated
- c. Detector lead position
- d. Number of proper system responses
- e. Number of failures of system to respond properly.



P3213

Fig. 2.7 - Test Configuration, Moving Target

#### 2.4.6 Test Procedure

The lead angle servo mechanism and detector support frame will be attached to the stationary test pedestal with a pivot arrangement so as to demonstrate target pop-up and fall compatability. This feature will not be mechanized on the test target.

Target motion represented shall be either left or right at an angle of  $45^\circ$ , toward or away from the firing line with the target facing in the direction of motion. The following representative target speeds will be tested:

- a. Target moves 5 or 7.5 meters in two seconds
- b. Target moves 5, 7.5 or 10 meters in two seconds
- c. Target moves 5, 7.5 or 10 meters in four seconds.

To initiate a test, the operator will input the range to the lead servo control and program the target speed into the velocity function generator. The operator will then activate the target's simulation motion. The resulting lead displacement of the target frame will be measured with the scale and This test will be replicated at 25 meter increments from 25m to 200m. The resulting data will be used to assess the simulation effectiveness of the moving-target lead mechanism.

#### 2.4.7 Acceptance Criteria

The breadboard model of the moving-target radiation detector should demonstrate the proper lead displacement at all target speeds and ranges as specified. (3.2.1 & 4.4.4.2.2.2 of N2234-129A).

#### 2.4.8 Test Recording

Data for this test element will be recorded on the test record form shown in Figure 2.8.

#### 2.4.9 Tolerance Data

Figure 2.9 shows the lead, in meters, as a function of firing range for the several target speeds (steady-state) which are required.

The breadboard moving-target detector mechanism must correctly position the detector frame to within  $\pm 10$  percent of maximum displacement for all of the specified target speeds and ranges.

#### 2.5 EFFECTIVE SIMULATION OF FIRING WITH SERVICE AMMUNITION AT SCALED RECORD FIRE RANGE

**TYPE TEST:** TARGET LEAD, MOVING TARGET

**DATE:** \_\_\_\_\_ **TIME** \_\_\_\_\_

[illegible]

TEST CONDUCTED BY: \_\_\_\_\_

TEST WITNESSED BY: \_\_\_\_\_

APPROVAL BY: \_\_\_\_\_

**DATE:** \_\_\_\_\_

**FIG. 2.7 - TEST RECORD FORM, MOVING TARGET**

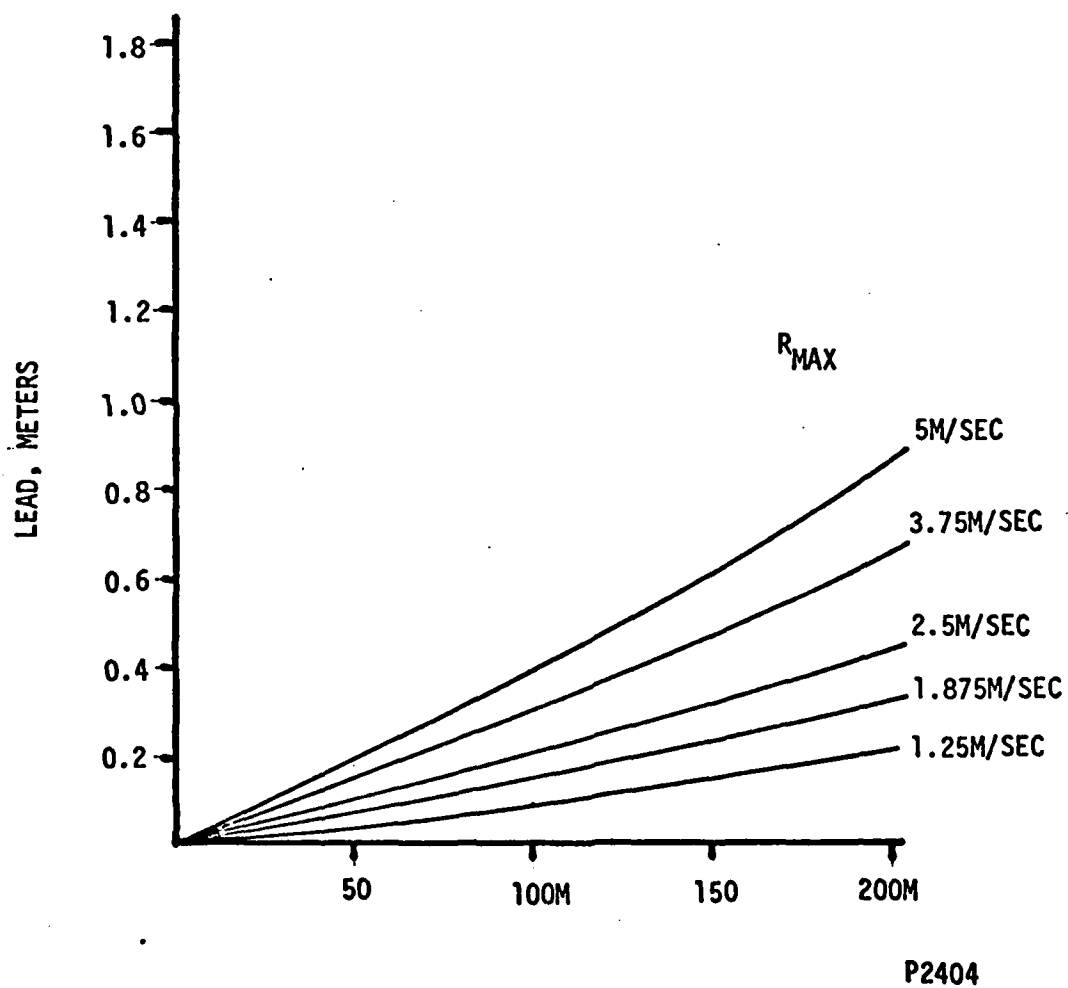


Figure 2.9. Required Lead Versus Target Velocity  
And Range (45° Track Relative To Line-Of-Sight)

### 2.5.1 Objective

These tests will utilize special testing targets with a matrix of aiming points provided both inside and outside of a superimposed target shape. Matrix aiming points will be where vertical and horizontal lines cross and will be close enough together to establish "hit" and "miss" areas within the required tolerance when the aiming points are "fired" upon successively by the test operator utilizing trainer equipped weapons. "Hit" or "miss" will be sensed with hits being indicated on the control unit. The results of each "shot" will be recorded on prepared tables or charts, and the "hit" and "miss" areas plotted on scale targets for submission with the test report. This test will be conducted for each type target specified at the minimum, maximum and intermediate specified ranges.

### 2.5.2 Equipment Required

- a. Scale targets (breadboard CLIN 0003AD)
- b. Scale target laser radiation detector (Breadboard CLIN0003AD)
- c. Target Control unit (breadboard CLIN 0003AD)
- d. Laser transmitter (breadboard CLIN 0003)
- e. Transmitter aperture cap (Breadboard CLIN 0003AD)
- f. M16A1 Rifle
- g. Test target
- h. Machine rest.

### 2.5.3 Test Set-up

This test will be performed using the configuration shown in Figure 2.10.

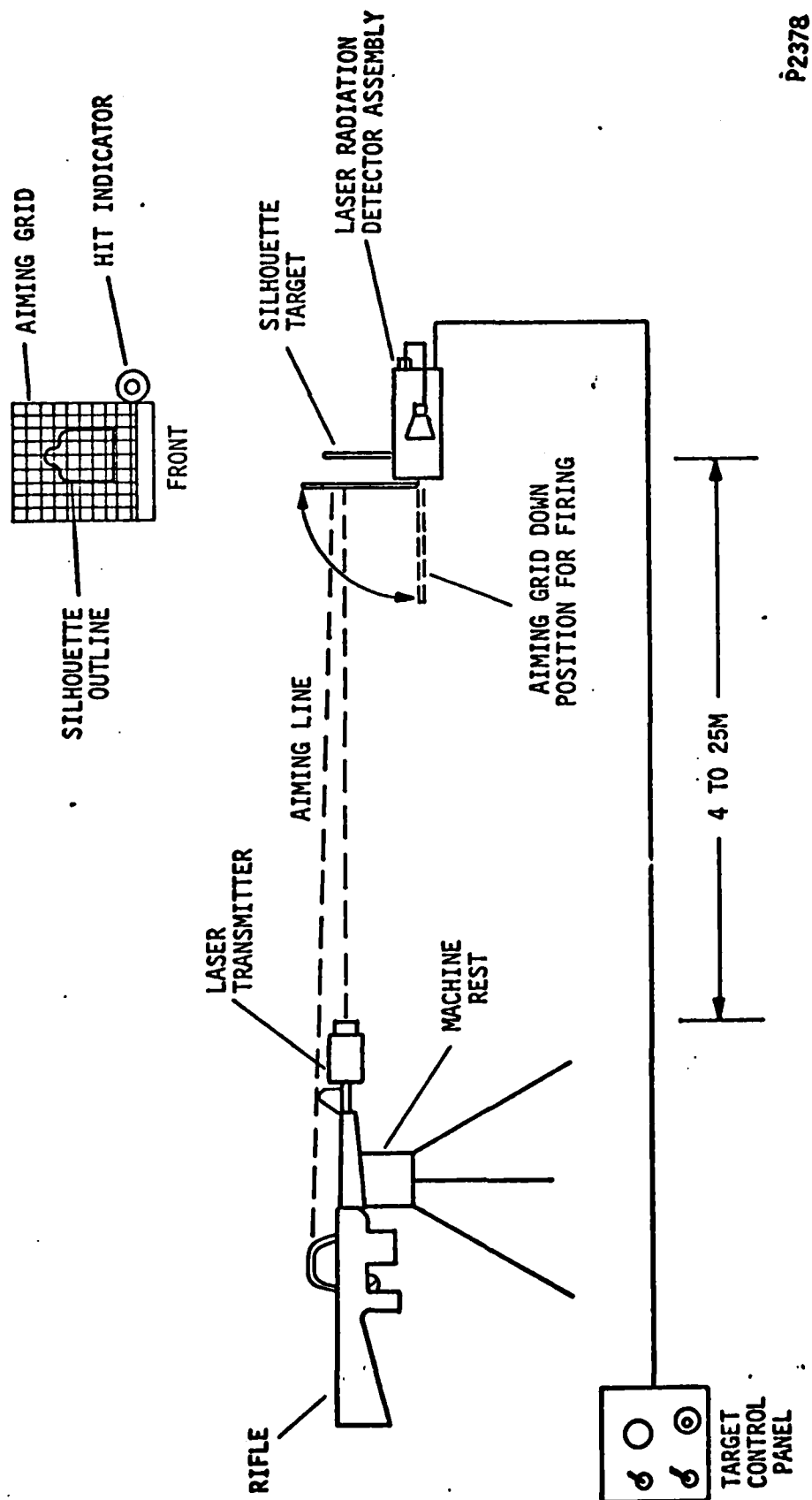
### 2.5.4 Test Duration

The estimated time required for this test is 1 day.

### 2.5.5 Data Required

The following data will be required throughout all firings conducted during this test element:

- a. Range to target
- b. Target configuration
- c. Location of aim point
- d. Number of shots fired
- e. Number of recorded target hits
- f. Number of false hits recorded
- g. Number of proper system responses
- h. Number of failures of system to respond properly.



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Figure 2.10 1/12 Scale Test Target Configuration

### 2.5.6 Test Procedure

The test target will be mounted with a hinge on the 1/12 scale target assembly. The hinge will allow the test target to be positioned in front of the 1/12-scale target.

The weapon with the laser transmitter attached will be mounted on a machine rest capable of adjustment to allow point-of-aim to be positioned on the grid aiming points provided and capable of holding point-of-aim constant after adjustment. The test target will be folded out of the line-of-sight and the laser fired. A hit on the target will be indicated by a hit indicator on the control unit panel which is connected to the laser radiation detector output of the 1/12-scale target assembly.

For scaled ranges between 50 and 100 meters, the scale target used will be compatible with an F-type silhouette target; for ranges between 150 and 300 meters, the scale target will be compatible with an E-type silhouette target.

A set of aiming points will be selected on the test target. These points will lie outside the silhouette target such that laser pulses aimed at these points should not trigger the Hit Indicator. In addition to these aiming points, a second set of aiming points which are within the target silhouette such that laser pulses aimed at these points should trigger the Hit Indicator.

At each of the ranges indicated in Table I, below, firings will be conducted using each of the aiming points of the group as indicated:

TABLE I - TARGET TYPE/SCALE RANGE

<u>Target Range, Meter</u>	<u>Target Type</u>
300	E
250	E
200	E
150	E
100	F
50	F

Upon completion of the testing, the ratio of indicated hits to total simulated rounds fired will be calculated for each range of fire at each aim point considered. The relationship between percent correct response, range and percent incorrect response, range will be determined. Data will be combined to provide best estimates of effective simulation.

### 2.5.7 Acceptance Criteria

The breadboard models of the laser transmitter, scale targets and scale target laser radiation detector should provide

effective simulation of firing service ammunition as specified (3.6.10.1.1 of N2234-129A) at simulated ranges (48 to 300 meters) when fired upon with M16A1 Rifles equipped with laser transmitters at 1/12-scale ranges (4 to 25 meters).

2.5.8     Test Recording

Data for this test element will be recorded on the form and chart illustrated in Figures 2.2 and 2.3.

2.5.9     Tolerance Data

The effective size of the scale target must replicate the actual visual size to within  $\pm 10$  percent at all specified ranges for all target types.

## APPENDIX A

### 1.0 Turn-on and Turn-off Procedures of the Trainer

The effective simulation, range and alignment tolerance test will be conducted using breadboard hardware, therefore, detail trainer operating procedures are not appropriate to this document.

### 2.0 Cross Reference Listing of the Trainer Specifications and the Applicable Test That Applies

Specifications for MAGLAD device A3F77 are given in N2234-129A dated 9 August 1976 and further detailed in Section F of Contract No. N61339-76-C-0116. Following is a cross-reference listing from the trainer specification to the applicable test detailed in this document:

#### TRAINER SPECIFICATION

#### TEST SECTION

3.2.1.....	2.2
3.2.5.1.....	2.1
3.2.5.2.....	2.1
3.6.1.....	2.2
3.6.1.1.....	2.2
3.6.1.2.....	2.2
3.6.1.3.....	2.2
3.6.3.....	2.1
3.6.9.....	2.4
3.6.9.1.....	2.4
3.6.10.1.....	2.5
3.6.10.1.1.....	2.5
3.7.4.....	2.1
3.7.5.2.....	2.2
4.4.2.2.a.....	2.0
4.4.2.2.2.....	2.0

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